Attachment 2. WisCALM 2016 Survey Results Summary Report

Prepared by: Aaron Larson
June 30, 2014

Survey Purpose

The purpose of this survey was to collect feedback from users of Wisconsin's Consolidated Assessment and Listing Methods (WisCALM) about specific areas of the guidance that should be created or updated. A total of 27 potential topics were identified, representing sections of WisCALM guidance needing update or revision. The candidate topics were identified through previous surveys, biologists' comments and EPA and public comments on previous versions of the guidance. This survey included lists of these topics grouped by waterbody type for priority ranking (high, medium, low) and comments. Responses to the section on general topics were required, while the remaining sections were optional (e.g., lake specialists may have completed the lake and beach section, and not the stream section). A comment field was provided for: 1) listing additional topics for consideration, and 2) noting interest in participating on a workgroup to develop guidance for that topic.

The target audience of the survey was WisCALM users, primarily the lake specialists and stream biologists, which comprised a majority of the 21 survey respondents. A list of survey respondents who provided their names is provided in Appendix A; four respondents completed the survey anonymously. Thanks is extended to all those who participated in the survey.

General Topics

This portion of the survey requested rankings of general topics about our assessment methods that are being considered for updates. These topics are "general" in the sense that they do not pertain to a specific waterbody / media type. Of the eight general topics, three topics scored on average greater than a "medium priority" (i.e. average score > 2): delisting methods, water quantity, and antidegradation (Figure 1). These topics and recommendations on guidance development/revisions are described more specifically below. Brief descriptions of all proposed topics are provided in Appendix B.
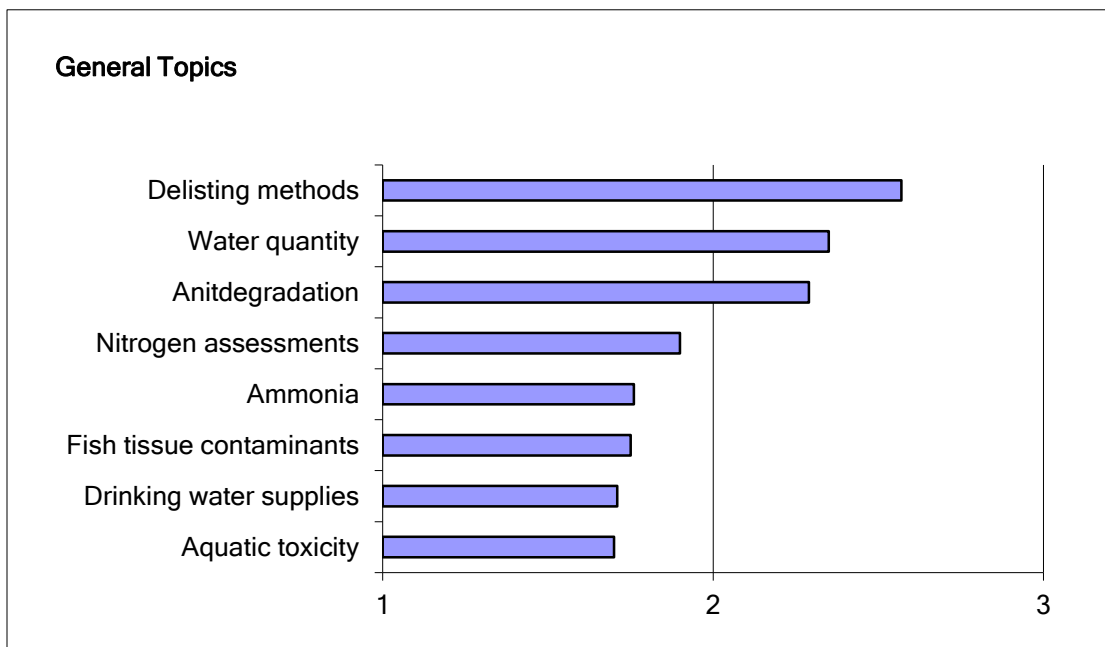

Figure 1. Average priority ranking for general topics (1 = low priority, 2 = medium priority, and 3 = high priority).

Delisting methods: WisCALM updates are needed to add specificity regarding methods for delisting pollutants or impairments from the impaired waters list. Among the general topics presented in the survey, this topic was ranked highest for update needs. An ad hoc workgroup (subgroup of the WARP Advisory Team) was formed to develop recommendations for addressing this topic. The workgroup recommended that, in general, methods used to delist an impairment should be the same as methods used for listing (i.e. data are summarized the same and the same thresholds are applied). However, if the assessment method changes after the initial listing, it was recommended to use the most up to date method for delisting, rather than relying on previous protocols used to make the listing. Also, in cases where the confidence interval approach rather than a single measure of central tendency is used to compare against a threshold (this is currently only used for TP and chlorophyll assessments), the workgroup recommends that the lower confidence limit value be used for listing decisions and the upper confidence limit be used for delisting decisions. These recommendations will be incorporated in WisCALM 2016. No additional revisions are recommended at this time, but future assessment method updates for new indicators should include delisting protocols.

Water quantity: WisCALM currently does not address aquatic life habitat impairments related to low flow/water levels. This topic was ranked second of the eight proposed general topics for WisCALM revision. Therefore, methods to assess fish and aquatic life use impairments due to low water level / stream flow are recommended to be developed by a workgroup. An existing workgroup has been formed to incorporate flow/water level monitoring in the revised Water Division Monitoring Strategy. I recommend that this same workgroup also develop assessment guidance for water quantity-related data that will be collected as part of this revised monitoring strategy.

Antidegradation: Antidegradation is an integral component of a state's water quality standards (i.e., designated uses; criteria to meet those uses; and antidegradation policies). CWA Section 303(d) and EPA's implementing regulations require States to identify waters not meeting any applicable water quality standard (CWA §303(d)(1)(A), 40 C.F.R. 130.7(b)(3)). EPA's listing regulations specify that "applicable water quality standards" refer to criteria, designated uses, and **antidegradation requirements** (40 CFR 130.7(b)(3)). Most states' water quality assessments focus on whether numeric and narrative water quality criteria are being attained, and typically, these assessments capture where waters are most in need of restoration. However, by also considering whether waters are meeting antidegradation requirements, it may be possible to identify waters that are not meeting the antidegradation portion of water quality standards. Possible method updates could address antidegradation provisions of state water quality standards by identifying declining water quality trends or "threatened" waters. By assessing waters in this manner, there is a greater opportunity to protect human health and wildlife values, achieve healthy watersheds, and fulfill in a more cost-effective manner the CWA's primary objective to restore and maintain the nation's waters.

EPA intends to work with states and other stakeholders to develop guidance on how best to assess and identify waters to determine whether antidegradation requirements have been attained. This future guidance may be in the form of stand-alone IR guidance, or as part of future EPA biennial IR updates. A few survey respondents also indicated that, while the topic is a high priority, they prefer to delay WisCALM updates related to antidegradation provisions to a later date if and when proposed administrative rule revisions are adopted (note: antidegradation procedures revisions is a proposed topic for ranking in the current Triennial Standards Review (2015-2017). Based on these comments and pending EPA guidance on assessing attainment of a state's antidegradation standards, I recommend that WisCALM guidance development on this subject be deferred to a future update (2018 or beyond).

Stream Topics

This portion of the survey requested rankings of topics related to stream assessment methods being considered for updates. Of the six stream topics, five topics scored on average greater than a "medium priority" (i.e. average score > 2): sediment-related thresholds, habitat assessment thresholds, spatial extent of assessments, and assessment unit revisions (Figure 2). Two topics (spatial extent of assessments and assessment unit revisions) have been partially addressed by a workgroup, but additional guidance is needed. The high ranking topics and recommendations on guidance development/revisions are described more specifically below.
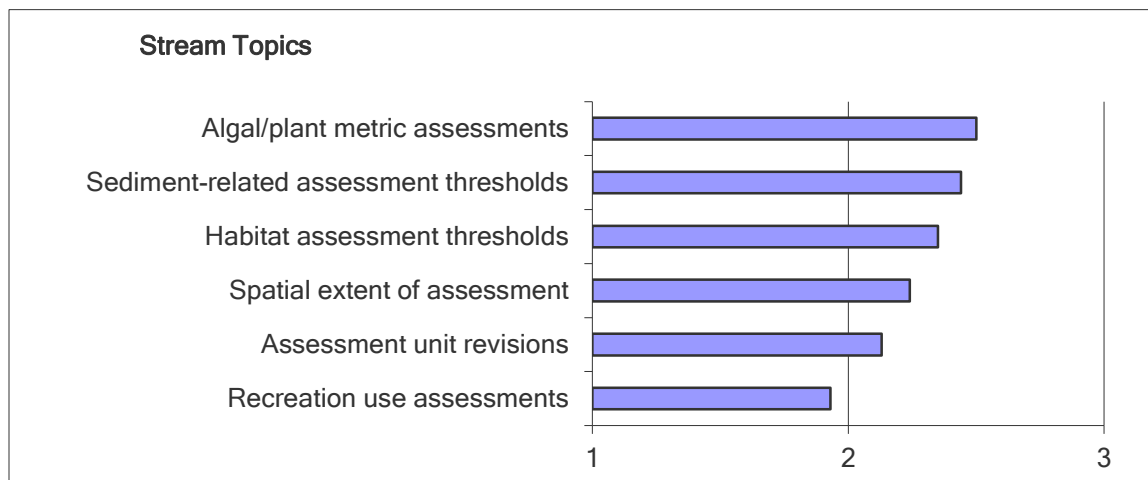

Figure 2. Average priority ranking for stream topics (1 = low priority, 2 = medium priority, and 3 = high priority).

Algal / plant metric assessments: WisCALM currently does not include methods to assess stream primary producers (e.g., algae or aquatic plants), which could serve as additional biological indicators of eutrophication. Of the six stream assessment topics, this topic was ranked the highest. Certain types of algae tend to have high dispersal rates and short generation times, making them well-suited to exhibiting rapid responses to stressors. Despite their infrequent use by state monitoring agencies, diatoms are widely recognized as valuable indicators of river and stream water quality because they: 1) are relative simple to collect, 2) have short regeneration times so respond quickly to stressors, 3) respond directly to nutrients and can be a more stable indicator of tropic state than measurements of nutrient concentrations or algal biomass (e.g., chlorophyll *a*), 4) are ubiquitous, allowing for comparisons across geographic regions, and 5) have been shown to be sensitive to physical habitat impairments such as bank stability, channel dimensions and riparian canopy coverage, flow regime, and stream substrate composition (Hill et al. 2000).

A workgroup is currently considering this topic in the context of phosphorus site-specific criteria to identify sensitive plant and/or algal metrics that respond to phosphorus impairments. Both qualitative (e.g., visual surveys and other rapid assessment methods) and quantitative (e.g., biomass, diatom metrics) assessment approaches are being considered by the workgroup. I recommend that the assessment methods identified by this workgroup be incorporated in WisCALM for identification of phosphorus-related biological impairments.

Total Suspended Solids (TSS) thresholds: In-stream suspended sediment and siltation and downstream sedimentation are common impairments to the designated uses of Wisconsin's surface waters. Approximately one-fifth of the Section 303(d) impairment listings to date are sediment-related (e.g., legacy sediment, turbidity, or TSS). More than three-quarters of these listings are degraded habitat impairments with TSS listed as a "cause" of impairment. These

habitat impairments were evaluated for listing on a case-by-case basis based on professional judgment. Assessment methods, including listing/delisting thresholds for TSS and/or habitat metrics like stream substrate size and embeddedness, would improve upon our consistency and transparency in sediment-related impairment assessments. Establishing assessment thresholds for TSS would also provide targets for watershed restoration efforts, including TMDLs and Nine-key Element Plans.

Numeric TSS criteria development is a proposed topic for ranking in the current Triennial Standards Review (2015-2017). TSS thresholds could be incorporated in WisCALM and used for listing and delisting decisions regardless of whether or not they are formally adopted as numeric criteria. These thresholds could be considered an implementation of current narrative water quality standards, which require controls on activities resulting in "objectionable deposits… [that] may interfere with public rights in waters of the state" (NR 102.04(1)(a)).

Assessment methods and thresholds for TSS could be derived from existing research, including a US Geological Survey study conducted in cooperation with the US EPA to determine present and reference concentrations and yields of suspended sediment in streams in the Great Lakes region and adjacent areas based on available long-term sample datasets (Robertson et al. 2006). I recommend an ad hoc workgroup be formed to develop methods, including numeric thresholds, for assessing TSS data.

Habitat assessment thresholds: Qualitative habitat assessment protocols are currently used during baseline monitoring. This protocol includes seven habitat parameters for streams less than 10 meters wide, and five parameters for streams greater than 10 meters wide, which are visually estimated. Each habitat parameter is given a rating of excellent, good, fair, or poor, and the associated individual numeric scores are summed to provide an overall rating of stream habitat quality, as described in "Guidelines for Qualitative Physical Habitat Evaluation of Wadeable Streams" (WDNR 2007).

Quantitative methods (WDNR 2002), adapted from Simonson et al. (1994), are often used when initial qualitative scores indicate a potential habitat impairment. Quantitative habitat assessment methods generally provide more accurate and precise measures than qualitative habitat assessments, but depending upon the specific data needs, qualitative assessments may provide worthwhile and cost-effective habitat information.

Historically, stream physical habitat information was evaluated using biologists' best professional judgment for impairment listing decisions. Nearly 250 stream impairment listings are attributed to "degraded habitat." I recommend an ad hoc workgroup be formed to develop listing/delisting thresholds for specific stream habitat metrics and/or overall habitat scores; these thresholds should be incorporated in WisCALM to guide impairment listing and delisting decisions.

Spatial extent of assessments: For assessment purposes, streams and rivers are divided into segments, known as "assessment units." Monitoring results may be collected at a specific point location or over multiple locations within an assessment unit. In some cases, it may be appropriate to apply data collected from one station to multiple stream segments. In other cases monitoring data, should be applied to single segment or a portion thereof. These decisions will likely depend on the types of parameters evaluated, consistency in the data collection timeframes and methods, and the similarity of adjacent assessment unit classifications and status. Assessment guidance is needed for making decisions on the spatial extent of a stream/river segment over which to apply data from one or more monitoring station.

Currently, draft assessments are conducted for each monitoring station with sufficient data (data from multiple stations are not combined), and assessment results for a particular station are applied to the entire assessment unit that the station is on. If multiple stations occur in an assessment unit and any one station indicates impairment, the entire assessment unit is deemed impaired. These draft impairment assessments are then reviewed by the local biologist on a

case-by-case basis, and the spatial extent of the draft assessments may be modified based on their best professional judgment.

In the near term, given the limited amount of time available to develop new guidance and multiple parameters and assessment scenarios that may be encountered, I recommend that we continue with current approach – biologist review the spatial extent of draft impairment assessments on a case-by-case basis. In future updates, more specific guidance should be added to WisCALM.

Assessment unit revisions: A subgroup of the Watershed Assessment, Restoration and Protection (WARP) Advisory Team was formed to develop guidance for delineating or revising delineations of assessment units (i.e. stream segments) and documenting changes. Several rules of thumb were identified for aggregating multiple assessment units for various program purposes (e.g., TMDL development) and could be used to guide the determination of start/end points for future assessment unit segmentation updates. I recommend incorporating this guidance in WisCALM 2016.

Lake Topics

This portion of the survey requested rankings of topics related to lake assessment methods being considered for updates. Of the ten lake topics, six topics scored on average greater than a "medium priority" (i.e. average score > 2): harmful algal bloom methods, lakeshore habitat methods, macrophyte assessments, impounded flowing waters bioassessments, lake classification terminology, and dissolved oxygen methods (Figure 3). Three topics – harmful algal bloom, lakeshore habitat, and lake macrophyte assessment methods - are being addressed, in part, by existing workgroups. I recommend that these workgroups consider expanding their scope of work to include the development or revision of related assessment methods. Recommendations on guidance development/revisions are described below in more detail.
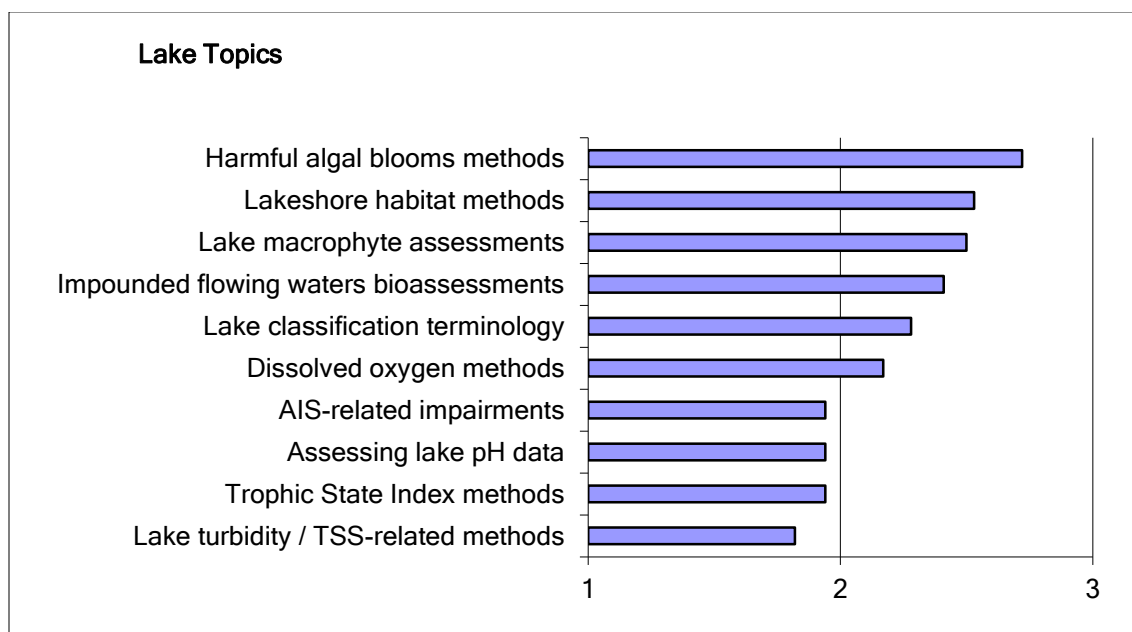

Figure 3. Average priority ranking for lake topics (1 = low priority, 2 = medium priority, and 3 = high priority).

Harmful algal bloom methods: Cyanobacterial blooms create aesthetic and ecological problems in lakes, hinder recreational use, and may pose health risks to humans and animals exposed to the blooms. The WDNR conducted a two-year study to investigate the frequency, severity, and duration of blue-green algae blooms, including information on which species of blue-green algae are present over the course of the summer. We also looked for the presence and concentrations of specific toxins: anatoxin-a (a neurotoxin), microcystin-LR (a hepatotoxin), and cylindrospermopsin (a cytotoxin). Samples were collected from five lakes in each of five regions, five times over the course of each summer (2004 and 2005) from sites where the potential for blooms was we believed to be high. Blue-green algae were present in approximately three-quarters of the nearly 400 samples collected during this project. Blooms occurred in all regions of the state. Species of blue-green algae most commonly detected included Anabaena sp., Aphanizomenon sp., Microcystis sp., and Planktothrix sp. Alerts were sent out to local public health agencies when concentrations of blue-green algae likely exceeded the World Health Organization (WHO) guideline of 100,000 cells/mL (a threshold of "moderate risk" to human health). The total number of alerts sent out was 33 in 2004 and 42 in 2005 (from: http://dnr.wi.gov/lakes/bluegreenalgae/).

Cyanobacterial toxin data have not been used as the sole basis for impaired waters listings in Wisconsin to date, but have been used for listings in other states such as California and Nebraska. Current WisCALM methods for assessing harmful algal blooms (e.g., cyanobacteria cell counts, toxins) for determining impairment of the Public Health and Welfare designate use include risk-based thresholds from the World Health Organization. WisCALM recommends using the "high risk" thresholds for cyanobacteria cell counts and toxin concentrations for impairment listing decisions; however, the guidance lacks a description of the minimum data requirements for assessment (i.e. appropriate sampling protocols, sampling frequency and season) and exceedance frequency for impairment determinations.

Cyanobacterial toxin and cell density criteria and/or guidance are also a proposed topic for ranking in the current Triennial Standards Review (2015-2017). Adopting the World Health Organization (WHO) recreational risk assessment guidelines on a provisional basis, drafting Wisconsin-specific recreational guidelines, or developing water quality criteria for cyanobacterial toxins are options currently being considered for ranking. Provisionally adopting the WHO guidelines could alleviate challenges in quantitative cell and toxin density determinations, as the guidelines include qualitative assessments, which are correlated with quantified risk factors.

A workgroup is currently evaluating whether additional algal response indicators (besides chlorophyll in lakes) can be used for use in determining eligibility for and setting site specific total phosphorus criteria, as well as potential standalone biocriteria. For the 2016 WisCALM updates, I recommend that this same workgroup develop assessment methods to correspond with indicators that are chosen for the related administrative rule-making efforts. This work should include expanding on the guidance currently included in WisCALM related to cyanobacterial cell counts and toxin concentration thresholds from the WHO (acceptable monitoring protocols, minimum data requirements, exceedance frequencies, etc.).

Lakeshore habitat assessment methods: Degraded lakeshore habitat is a common stressor for fish and aquatic life (Engel and Pederson 1998), but lakeshore habitat assessment methods are not currently addressed in WisCALM. Based on results from the U.S. EPA's National Lakes Assessment (NLA) conducted in 2007, the most widespread stressors are those that affect the shoreline and shallow water areas, which in turn can affect biological condition. Nationally, 36% of lakes are in poor condition, and poor biological health is three times more likely in lakes with poor lakeshore habitat relative to lakes with good habitat (U.S. EPA 2010).

The lack of lakeshore habitat assessment methods is a significant gap in our current WisCALM. A small workgroup is currently exploring the NLA habitat data, as well as supplemental habitat data from an additional 100 lakes statewide, and evaluating the use of the NLA lakeshore riparian

and shallow water habitat metrics for use in Wisconsin. Identifying thresholds for impairment assessment may be difficult in the southwestern part of the state (i.e. Temperate Plains), where data from fewer reference lakes is available. More habitat data from this area may be needed to develop statewide assessment tools. However, <mark>I recommend the existing workgroup continue to explore the feasibility of incorporating the NLA habitat assessment methods in WisCALM 2016, including identifying assessment thresholds for impairment decisions.</mark>

Lake macrophyte assessment methods: For assessment of biological response to phosphorus impairments in lakes, along with chlorophyll-a, aquatic macrophytes are proposed as a possible means of biological confirmation. An eight-member panel of botanists assessed the state of the aquatic macrophyte community in fourteen proposed lakes for the 2014 impaired waters list. The group used both multivariate and multimetric methods to judge the plant communities of the assessment lakes. Both methods were used to complement each other; each method proved valuable for different reasons. The review panel sought to decipher the driving factors behind low scores for either method so both methods were thoroughly interrogated. The resulting decisions were as follows: 5 "Good" lakes, 1 "Good/Fair" lake, 3 "Fair" lakes, 4 "Fair/Poor" lakes, and 1 "Poor" lake (see Figure 1, in Results and Discussion section). During the decision-making process, the review panel relied on more information than was captured by either method. For example, species richness and species identity were important factors for decision-making although none of the metrics used directly addressed those factors. As a result, the panel proposed several new metrics to explore for impairment decisions during future WisCALM assessment cycles.

The Aquatic Macrophyte Community Index (AMCI) is a multipurpose tool developed to assess the biological quality of aquatic plant communities in Wisconsin lakes. A workgroup is currently exploring the use of the AMCI, component metrics and other related metrics, as biological response indicators for total phosphorus assessments and site-specific phosphorus criteria development. <mark>I recommend that this workgroup's efforts also include developing methods for assessment of impairment of lake fish and aquatic life and recreation uses.</mark>

Beach Topics

This portion of the survey requested rankings of topics related to beach assessment methods being considered for updates. Of the three stream topics, two topics scored on average greater than a "medium priority" (i.e. average score > 2): harmful algal blooms, and additional beach assessment indicators (Figure 4). The three proposed topics and recommendations on guidance development/revisions are described more specifically below.
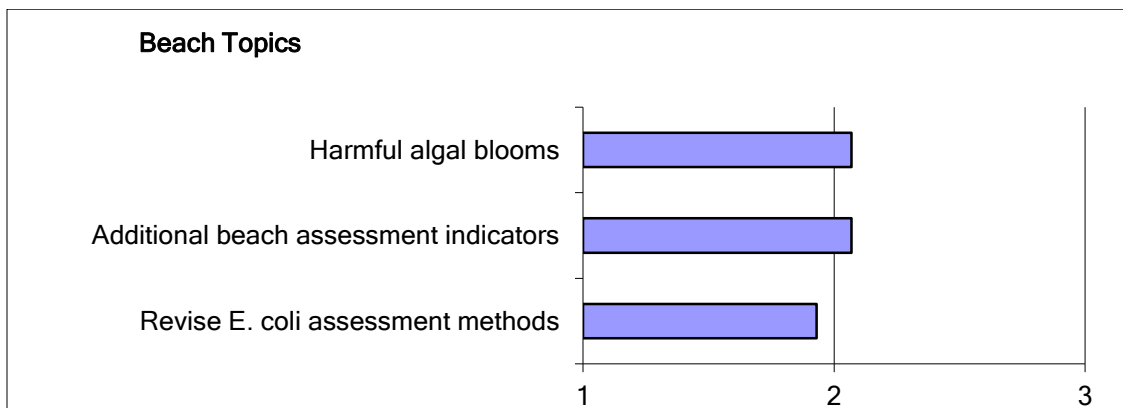

Figure 4. Average priority ranking for beach topics (1 = low priority, 2 = medium priority, and 3 = high priority).

Harmful algal blooms: For the past several years, large quantities of decaying algae, mostly Cladophora, have been fouling Wisconsin's Lake Michigan shoreline. Nuisance levels of algae at Great Lakes beaches may impair recreational uses of beach areas.

One of the topics included for ranking in the current Triennial Standards Review (2015-2017) is the development of algae-related standards for nearshore Great Lakes areas (Lake Michigan). Proposed standards and/or assessment methods could include development of a method to apply the narrative standards in s. NR 102.04(1) to assess Cladophora levels in order to identify recreational use impairments of Great Lakes beaches. I recommend that an ad hoc workgroup develop methods for assessing Great Lakes near shore area recreational use impairments due to Cladophora densities.

Revise *E. coli* assessment methods and incorporate additional beach assessment indicators: Federal criteria for *Escherichia coli* (*E. coli*) are applicable to the open waters of the Great Lakes – including beaches. In Wisconsin, inland beaches follow the same monitoring and assessment protocol as the Great Lakes beaches. *E. coli* is a species of bacteria that serves as an indicator of the presence of fecal matter in the water – suggesting that there may be harmful bacteria, viruses, or protozoans present that elevate risk to humans.

Monitoring for E. coli at many public beaches along the shorelines of Lake Michigan and Lake Superior is conducted in accordance with the Beach Environmental Assessment and Coastal Health Act of 2000 (the BEACH Act). Since 2003, approximately 120 monitoring sites at public beaches in Wisconsin are sampled for *E. coli* for implementation of the BEACH Act.

EPA has recently revised water quality criteria guidance for the protection of recreation uses (U.S. EPA 2012). The guidance includes a Statistical Threshold Value (STV) for *E. coli* of 410 colony forming units (cfu) /100 mL and a geometric mean (GM) maximum of 126 cfu/100 mL (for an estimated illness rate of 36 per 1,000 primary contact recreators). Currently when evaluating *E. coli* data to determine if a beach should be included on the impaired waters list, WDNR applies only the geometric mean criterion to those datasets. However, U.S. EPA recommends that a state assess all readily available data against both the GM and the STV would be part of the WQS and therefore both targets would be used to determine whether a waterbody meets the WQS for primary contact recreation (U.S. EPA 2012). EPA also expects that water quality attainment determinations would include water quality monitoring data collected as part of a beach notification program, as well as information regarding beach closures and advisories.

Because we are considering revisions to water quality standards to incorporate EPA's revised recreation use criteria, I recommend that WisCALM guidance development on this subject be deferred to a future update (2018 or beyond). Future updates should include methods for assessing pathogen data against all applicable recreation use criteria, as well as beach closure/advisory information.

References Cited

Barbour, M.T., J. Gerritsen, B.D. Snyder, and J.B. Stribling. 1999. Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates and Fish, Second Edition. EPA 841-B-99-002. U.S. Environmental Protection Agency; Office of Water; Washington, D.C.

Engel, S. and J. Pederson. 1998. The Construction, Aesthetics, and Effects of Lakeshore Development: a Literature Review. Wisconsin. Dept. of Natural Resources, Report 177. Madison, Wisconsin. http://digital.library.wisc.edu/1711.dl/EcoNatRes.DNRRep177.

Hill, B.H., A.T. Herlihy, P.R. Kaufmann, R.J. Stevenson, F.H. McCormick, and C.B. Johnson. 2000. Use of periphyton assemblage data as an index of biotic integrity. Journal of the North American Benthological Society 19:50-67.

Robertson, D.M., Saad, D.A., and Heisey, D.M., 2006, Present and Reference Concentrations and Yields of Suspended Sediment in Streams in the Great Lakes Region and Adjacent Areas: U.S. Geological Survey Scientific Investigations Report 2006–5066, 35 p.

Simonson, T. D., J. Lyons, and P. D. Kanehl. 1994. Guidelines for evaluating fish habitat in Wisconsin streams. U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station, General technical Report NC-164, St. Paul, Minnesota.

U.S. EPA. 2012. Recreational Water Quality Criteria. U.S. Environmental Protection Agency: Washington, DC. EPA 820-F-12-058.

Wang, L., J. Lyons, and P. Kanehl. 2006. Development and evaluation of a habitat rating system for low-gradient Wisconsin streams. North American Fisheries Management 18:775-785.

Appendix A. We wish to thank the Survey Participants!

A total of 21 respondents completed the survey. The following table is a list of survey respondents who provided their names; four respondents completed the survey anonymously.

#	Responses	Date
1	Buzz Sorge	5/16/2014 10:20 AM
2	Oldenburg	5/16/2014 10:11 AM
3	Donalea	5/13/2014 9:26 AM
4	Jim Amrhein	5/9/2014 1:10 PM
5	Rachel Sabre	5/9/2014 12:04 PM
6	Jen Filbert	5/9/2014 11:07 AM
7	Andrew Hudak	5/7/2014 1:04 PM
8	Mike Shupryt	5/7/2014 9:31 AM
9	Kris Stepenuck	5/6/2014 3:49 PM
10	Andrew Fayram	5/5/2014 10:58 AM
11	Katie Hein	5/5/2014 9:33 AM
12	Weigel	5/5/2014 9:11 AM
13	Ashley	5/2/2014 4:20 PM
14	Jim Kreitlow	5/2/2014 1:15 PM
15	Kristi Minahan	5/2/2014 11:29 AM
16	Alex Smith	5/2/2014 10:14 AM
17	Sara Strassman	5/2/2014 10:00 AM

Appendix B

All proposed WisCALM update topics, as they were described in the survey, are listed below.

General Topics

- Add specificity to guidance regarding methods for delisting pollutants or impairments from the impaired waters list

- Develop methods to assess fish and aquatic life use impairments due to low water level / stream flow.

- Develop methods for applying narrative standards to assess eutrophication impairments caused by excess nitrogen.

- Develop methods to address antidegredation provisions of state water quality standards (e.g., declining water quality trends or "threatened" waters).

- Identify indicators and develop methods for assessing surface waters used as public drinking water supplies.

- Clarify methods used for impairment assessments related to fish tissue contamination (e.g. mercury, PCB).

- Develop guidance for assessing ammonia data against water quality standards.

- The impaired waters list includes several listings for acute or chronic aquatic toxicity with unknown pollutants/causes. Develop procedures for interpreting results of laboratory bioassays (i.e. toxicity testing) of ambient surface waters.

Stream Topics

- Develop guidance for revising delineations of assessment units (i.e. stream segments) and documenting changes.

- Develop guidance to determine the appropriate spatial extent over which to extrapolate results from a particular station.

- Develop thresholds for select habitat metrics and/or overall habitat scores (qualitative or quantitative) for impairment assessments.

- Develop thresholds for assessment of sediment-related impairments (e.g., legacy sediment, turbidity, or TSS).

- Update methods for assessing stream recreation use using bacteria sample data.

- Develop methods to assess biological indicators of stream eutrophication (i.e. algae or aquatic plants).

Lake Assessments

- Develop methods to use Trophic State Index (TSI) data for impairment assessments. Currently, the TSI is used for general assessments only.

- Develop methods for assessing turbidity/TSS in lakes, as opposed to algal-related turbidity (which is addressed by trophic state indicators).

- Further develop methods for assessing impounded flowing waters (i.e., impoundments with <14-day residence time) using biological (e.g. algae, macrophytes) and physiochemical indicators (e.g., Secchi depth, dissolved oxygen).

- Adjust methods to use pH as an impairment indicator for softwater lakes, acid deposition, mining impacts, etc. (vs. as an indicator of eutrophication).

- Incorporate invasive species impacts in assessment of recreation and aquatic life uses of lakes.

- Research and further develop lake macrophyte assessment tools (e.g., Aquatic Macrophyte Community Index).

- Refine methods for assessing harmful algal blooms (e.g., cyanobacteria cell counts, toxins) for determining impairment of the Public Health and Welfare designate use.

- Develop assessment methods and thresholds for lakeshore habitat metrics.

- Synchronize lake classification terminology so that natural community classes are the same as those in Chapter NR 102 Wisconsin Administrative Code.

- Review and update (as needed) dissolved oxygen and temperature assessment methods for consistency with water quality criteria (e.g. exceedance frequency and impairment thresholds).

Beach Assessments

- Develop methods for additional beach assessment indicators / parameters (e.g. beach closures, statistical threshold values).

- Review current assessment methods for comparing E. coli against applicable water quality criteria (i.e., monthly aggregation of sample data for calculation of geometric means) for consistency with the federally-promulgated Bacteria Rule for Coastal and Great Lakes Recreation Waters.

- For Great Lakes beaches and near shore waters, develop assessment methods for impairments related to harmful algal blooms (e.g., Cladophora blooms, cyanobacteria cell counts, toxins).